CLAIMS

1. A device, which comprises a surface layer that has incorporated therein at least one radioactive nuclide.

2. A device which comprises a substrate and a self-assembled layer that has incorporated therein at least one radioactive nuclide.

3. A device according to claim 2, wherein the substrate is selected from the group consisting of stainless steel, Nitinol, silicon, quartz, cobalt chrome and polymers.

4. A device according to claim 1, wherein the self-assembled layer is an anchored SAM.

5. A device according to claim 2, wherein the anchored SAM is selected from the group consisting of monolayers or films anchored by siloxane, thiol, amine or phosphonate.

6. A device according to claim 1, comprising a substrate of a metal selected from the group consisting of stainless steel and Nitinol and a self-assembled layer anchored by phosphonate.

7. A device according to claim 1, wherein the surface layer is formed of a radioactive material.

8 A device according to claim 1, wherein the surface layer is formed of a radioactive material that has been activated to induce radioactivity therein after its final formation.

9. A device according to claim 1, which comprises a chemically functionalized SAM incorporating radionuclides attached at the surface of the device.

10 A device comprising a substrate covered on all its surfaces by a self-assembled layer, which layer includes radioactive nuclides, and having no other protective layer or coating over said self-assembled layer.

11. A temporary or permanent therapeutic implant, comprising a substrate and a radioactive self-assembled surface layer.

12. An implant according to claim 11, wherein the self-assembled surface layer is an anchored SAM.

13. A device according to claim 11, which is a stent for use in angioplasty.

14. A device according to claim 11, wherein the surface layer has a thickness of less than 10 nm.

15. A device according to claim 11, wherein the substrate is made of Nitinol.

16. A device which comprises a substrate and a self-assembled layer that has incorporated therein at least one radioactive nuclide, wherein the nuclide is selected from the group consisting of I-131, F-18, C-11, Br-83, Br-82 and Cu-64.

17. Process for making a device according to claim 1, which comprises providing a substrate, forming on the substrate a self-assembled surface layer, and providing said self-assembled layer with a radioactive material.

18. Process according to claim 17, wherein the surface layer is made of radioactive material.

19. Process according to claim 17, wherein the surface layer is made of non-radioactive material and is then labeled with a radionuclide.

20. Process according to claim 17, wherein the self-assembled surface layer is a chemically functionalized SAM incorporating radionuclides.

21. Process according to claim 17, wherein the self-assembled surface layer is labeled with iodine.

22. Process according to claim 21, wherein the surface layer is labeled with iodine by adding radioiodide in the presence of an oxidant.

23. Process according to claim 14, wherein the [substrate] surface layer is labeled with fluorine-18 or carbon-11.

24. Process according to claim 15, wherein the substrate is made of a material selected from the group consisting of silicon, quartz and Nitinol.

25. Process according to claim 20, wherein the SAM is a siloxane-anchored SAMs based on functionalized alkyltrichlorosilanes.

26. Process according to claim 29, wherein the substrate is made of a material selected from the group consisting of stainless steel and cobalt chrome which have native oxide layers.

27. Process according to claim 26, wherein the native oxides are enhanced by applying an overlayer of silicon oxide.

28. Process according to claim 17, wherein the self-assembled surface layer is formed by a solution-based process.

29 Process according to claim 17, wherein the self-assembled surface is provided with a radioactive material by *in situ* covalent attachment of radionuclides.

30. A kit for the preparation of a device according to claim 1, which comprises a solid device bearing a functionalizable thin film and the reagents for derivatizing said film with a radionuclide or a radionuclide-containing material.

31. A kit for the preparation of a device according to claim 1, which comprises a solid device that is not coated with a functionalizable thin film but rather provides the means for applying such a film to it, and, optionally, means for derivatizing said film with a radionuclide or a radionuclide-containing material.

32. A process for the preparation of a device according to claim 1, which comprises providing a kit which comprises a solid device bearing a functionalizable thin film and the reagents for derivatizing said film with a radionuclide or a radionuclide-containing material, and carrying out the derivatizing when the device is to be used.

33. A process for the preparation of a device according to claim 1, which comprises providing a kit which comprises a solid device that is not coated with a functionalizable thin film but rather provides the means for

applying such a film to it, and, optionally, means for derivatizing said film with a radionuclide or a radionuclide-containing material, and carrying out the application of said film and the derivatization thereof when the device is to be used.

34. Method of applying radioactive radiation to an organ or vascular structure of the human body, which comprises providing a device according to claim 1, and inserting said device into said organ or vascular structure.

35. Method of applying radioactive radiation to an organ or vascular structure of the human body, which comprises providing a solid device at or near the time and location at which radioactive radiation is to be applied to said organ or vascular structure, applying to said device a surface layer that has incorporated therein at least one radioactive nucleide, whereby to generate a device according to claim 1, and then inserting said radioactive device into said organ or vascular structure.